AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-11. *(canceled)*

12. *(canceled)*

13. *(previously presented)* The microscope of claim ~~12~~ 22, wherein the microscope is a laser scanning microscope.

14. *(previously presented)* The microscope of claim ~~12~~ 22, wherein the light diffracting means is traversed both by the excitation light and the emission light.

15. *(previously presented)* The microscope of claim 14, wherein the light emitted by the sample comprises fractions of the excitation light and of wavelength-shifted fluorescence fractions.

16. (*previously presented*) The microscope of claim ~~12~~ 22, wherein the light diffracting means influences at least one excitation wavelength by diffraction, whereas other wavelengths emitted by the sample pass in uninfluenced form through the element and are thereby spatially separated from the excitation light.

17. (*previously presented*) The microscope of claim 13, further including means for switching the light diffracting means by way of a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

18. (*previously presented*) The microscope of claim ~~12~~ 22, further including at least one optical means for influencing the light direction provided in at least one of the excitation beam path upstream of the light diffracting means and the detection beam path downstream of the light diffracting means in order to improve light fraction separation.

19. (*previously presented*) The microscope of claim ~~12~~ 22, wherein the light diffracting means comprises an AOTF.

20. (*previously presented*) The microscope of claim 18, wherein the optical means comprises a reflection element.

21. *(previously presented)* The microscope of claim 18, wherein the optical means comprises a light refracting element.

22. *(previously presented)* A microscope having a microscope beam path and including:

means for imaging excitation light towards a sample in the microscope beam path, whereby the sample emits excitation and wavelength-shifted emission light,

light diffracting means for feeding the excitation light into the microscope beam path by diffraction of the excitation light, for separating excitation light and wavelength-shifted emission light emitted by the sample in the microscope beam path by diffraction of the excitation light, and for simultaneously regulating the excitation intensity,

detection means for detecting the wavelength-shifted emission light emitted by the ,sample following separation of the wavelength-shifted emission light from the excitation light by the diffracting means,

wherein wavelength-shifted emission light is transmitted undiffracted through the light-diffracting means and the light diffracting means is so positioned with respect to the beam path and the detection means that only undiffracted light is detected by the detection means.

23. *(canceled)*.

24. *(currently amended)* A microscope having a microscope beam path and including

a plurality of light sources which provide excitation light of different wavelengths for irradiating a sample,

means for imaging the excitation light towards a the sample in the microscope beam path, whereby the sample emits excitation and wavelength-shifted emission light,

a plurality of light diffracting means for feeding the excitation light into the microscope beam path by diffraction of the excitation light, for separating excitation light and wavelength-shifted emission light emitted by the sample in the microscope beam path by diffraction of the excitation light, and for simultaneously or individually feeding in different wavelengths and for independently and simultaneously regulating an excitation intensity of each of the light sources,

detection means for detecting the wavelength-shifted emission light emitted by the sample following separation of the wavelength-shifted emission light from the excitation light by the diffracting means,

wherein wavelength-shifted emission light is transmitted undiffracted through the light-diffracting means and the light diffracting means is so positioned with respect to the beam path and the detection means that only undiffracted light is detected by the detection means,

wherein the light diffracting means are arranged on a common optical axis, and

wherein the excitation light of each of the light sources is coupled into the microscope beam path by means of a separate on of the plurality of light diffracting means.

25. (*previously presented*) The microscope of claim 24, wherein the microscope is a laser scanning microscope.

26. (*previously presented*) The microscope of claim 24, wherein the light diffracting means comprise firstly an AOTF and then an AOM in the direction of detection.

27. (*previously presented*) The microscope of claim 24, wherein the light diffracting means is chosen from the group consisting of an AOTF and an AOM.

28. (*currently amended*) A fluorescence microscope comprising:

radiation means for irradiating a sample with excitation light, whereby the sample emits excitation and wavelength-shifted fluorescence light,

detection means for detecting wavelength-shifted fluorescence light emitted by the sample,

microscope optics means for directing excitation light from the radiation means towards the sample and for directing the excitation and the wavelength-shifted fluorescence light emitted by the sample back in the direction of the radiation means and detection means,

acousto-optical means for feeding the excitation light from the radiation means into the microscope optics means by diffraction of the excitation light, for simultaneously regulating an intensity of the diffracted excitation light and for separating excitation light and wavelength-shifted fluorescence light emitted by the sample by diffraction of the excitation light, the acousto-optical means being positioned between the radiation means and the microscope optics means in such a way that only diffracted excitation light is introduced into the microscope optics means, wherein:

excitation light emitted by the sample is diffracted in the direction of the radiation means by the acousto-optical means, and

wavelength-shifted fluorescence light emitted by the sample is transmitted undiffracted through the acousto-optical means and is thereby spatially separated from the excitation light emitted by the sample, and wherein:

the detection means is so positioned with respect to the acousto-optical means that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical means is detected by the detection means,

the acousto-optical means is so positioned with respect to the microscope optics means and the detection means that only undiffracted light is detected by the detection means, and

further comprising filter means for selectively detecting wavelength-shifted fluorescence light in the detection means located between the acousto-optical means and the detection means.

29. (*previously presented*) The fluorescence microscope of claim 28, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

30. (*previously presented*) The fluorescence microscope of claim 28, wherein the radiation means is a laser emitting excitation light.

31. (*previously presented*) The fluorescence microscope of claim 28, further comprising at least one optical means for influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical means and a detection beam path downstream of the acousto-optical means for the improved separation of the light fractions.

32. (*previously presented*) The fluorescence microscope of claim 31, wherein the optical means comprises a reflection element, selected from the group consisting of a mirror, a bimirror and a vapourized prism.

33. (*previously presented*) The fluorescence microscope of claim 31, wherein the optical means comprises a light refracting element which is located in at least one of an excitation beam path upstream of the acousto-optical means and a detection beam path downstream of the acousto-optical means.

34. (*previously presented*) The fluorescence microscope of claim 33, wherein the light refracting element comprises an unvapourized prism.

35. (*previously presented*) The fluorescence microscope of claim 32, wherein the optical means further comprises a light refracting element which is located in at least one of an excitation beam path upstream of the acousto-optical means and a detection beam path downstream of the acousto-optical means.

36. (*previously presented*) The fluorescence microscope of claim 35, wherein the light refracting element comprises an unvapourized prism.

37. (*currently amended*) A fluorescence microscope, comprising:

radiation means for emitting excitation light for irradiating a sample, whereby the sample emits excitation and wavelength-shifted fluorescence light,

detection means for detecting wavelength-shifted fluorescence light emitted by the sample,

microscope optics means for directing excitation light from the radiation means towards the sample and for directing the excitation and the wavelength-shifted fluorescence light emitted by the sample back in the direction of the radiation means and the detection means,

acousto-optical means for feeding the excitation light from the radiation means into the microscope optics means by diffraction of the excitation light, for simultaneously regulating an intensity of the excitation light, and for separating excitation light and wavelength-shifted fluorescence light emitted by the sample by diffraction of the excitation light, the acousto-optical means being positioned between the radiation means and the microscope optics means in such a way that only diffracted excitation light is introduced into the microscope optics means, wherein:

excitation light emitted by the sample is deflected in the direction of the radiation means by diffraction by the acousto-optical means, and

wavelength-shifted fluorescence light emitted by the sample is transmitted undiffracted through the acousto-optical means and is thereby spatially separated from the excitation light emitted by the sample,

the detection means is so positioned with respect to the acousto-optical means that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical means is detected by the detection means,

the acousto-optical means is so positioned with respect to the microscope optics means and the detection means that only undiffracted light is detected by the detector means and further comprising:

filter means for selectively detecting wavelength-shifted fluorescence light in the detection means which is positioned between the acousto-optical means and the detection means, and

at least one element for influencing the light direction and for separating the light fractions, wherein the element is selected from the group consisting of reflecting and refracting elements and which is located in at least one of an excitation beam path upstream of the acousto-optical means and a detection beam path downstream of the acousto-optical means.

38. (*previously presented*) The fluorescence microscope of claim 37, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

39. (*previously presented*) The fluorescence microscope of claim 37, wherein the radiation means is a laser.

40. (*previously presented*) The fluorescence microscope of claim 37, wherein the at least one element for influencing the light direction and for separating the light fractions is an unvapourized prism.

41. (*previously presented*) The fluorescence microscope of claim 28, wherein the acousto-optical means comprise firstly an AOM and then an AOTF in the direction of the microscope optics means.

42. (*previously presented*) The fluorescence microscope of claim 37, wherein the acousto-optical means comprise firstly an AOM and then an AOTF in the direction of the microscope optics means.

43. (*previously presented*) A fluorescence microscope, comprising:

radiation means for emitting excitation light for irradiating a sample, whereby the sample emits excitation and wavelength-shifted fluorescence light, the radiation means comprising a plurality of light sources which provide excitation light of different wavelengths,

detection means for detecting wavelength-shifted fluorescence light emitted by the sample,

microscope optics means for directing excitation light from the radiation means towards the sample and for directing the excitation and the wavelength-shifted fluorescence light emitted by the sample back in the direction of the radiation means and the detection means,

a plurality of acousto-optical means which are arranged on a common optical axis for individually feeding the excitation light from the light sources into the microscope optics means by diffraction of the excitation light, for independently and simultaneously regulating an excitation intensity of each of the light sources,

a plurality of acousto-optical means for feeding the excitation light from the radiation means into the microscope optics means by diffraction of the excitation light, and for separating excitation light and wavelength-shifted fluorescence light emitted by the sample by diffraction of the excitation light, the acousto-optical means being so positioned between the radiation means and the microscope optics means that only diffracted excitation light is introduced into the microscope optics means, wherein:

in the direction of the microscope optics means as the acousto-optical means are firstly provided an AOM and then an AOTF,

excitation light emitted by the sample is deflected by diffraction in the direction of the radiation means by the acousto-optical means, and

wavelength-shifted fluorescence light emitted by the sample is transmitted undiffracted through the acousto-optical means and is thereby spatially separated from excitation light emitted by the sample,

the detection means is so positioned with respect to the acousto-optical means that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical means is detected by the detection means, and

the acousto-optical means is so positioned with respect to the microscope optics means and the detection means that only undiffracted light is detected by the detection means, and further comprising:

filter means for selectively detecting wavelength-shifted fluorescence light in the detection means positioned between the acousto-optical means and the detection means.

44. (*previously presented*) The fluorescence microscope of claim 43, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

45. (*previously presented*) The fluorescence microscope of claim 43, wherein the radiation means is a laser.

46. (*previously presented*) The fluorescence microscope of claim 28, wherein at least one optical fibre is provided for feeding in excitation light.

47. (*previously presented*) The fluorescence microscope of claim 37, wherein at least one optical fibre is provided for feeding in excitation light.

48. (*previously presented*) The fluorescence microscope of claim 43, wherein at least one optical fibre is provided for feeding in excitation light.

49. (*previously presented*) The fluorescence microscope of claim 43, further comprising at least one optical means for influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical means and a detection beam path downstream of the acousto-optical means to bring about improved separation of the light fractions.

50. (*previously presented*) The fluorescence microscope of claim 28, wherein:

the radiation means is constructed as a plurality of lasers having different wavelengths,

a plurality of the acousto-optical means are provided and with each laser is associated at least one acousto-optical means,

the acousto-optical means simultaneously or individually feeding the different wavelengths by diffraction in the acousto-optical means simultaneously or individually into a microscope beam path, and

the acousto-optical means also transmitting wavelength-shifted emission light and excitation light having in each case a different wavelength undiffracted through the respective acousto-optical means.

51. (*previously presented*) The fluorescence microscope of claim 28, wherein the acousto-optical means are chosen from the group consisting of an AOTF and an AOM.

52. (*previously presented*) The fluorescence microscope of claim 50, wherein the excitation power of each laser is independently adjustable with the respective acousto-optical means.

53. (*previously presented*) The fluorescence microscope of claim 30, wherein the acousto-optical means can be switched by a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

54. (*previously presented*) The fluorescence microscope of claim 28, wherein the excitation light is introduced into the microscope optics means by diffraction at the acousto-optical means in the first diffraction order.

55. (*previously presented*) The fluorescence microscope of claim 28, further comprising an excitation and detection pinhole located upstream of the microscope optics means.

56. (*previously presented*) The fluorescence microscope of claim 50, wherein the radiation of the plurality of lasers in the direction of the microscope optics means is successively fed into the microscope beam path in a sequence based on decreasing wavelength.

57. (*previously presented*) The fluorescence microscope of claim 28, wherein at least one of UV light, visible light and infrared light is fed into the microscope beam path.

58. (*previously presented*) A device for feeding light into a microscope beam path and for detecting emission light emitted by a sample, comprising:

a plurality of light sources which emit excitation light of different wavelengths, which excitation light is irradiated through the microscope beam path onto a sample, whereby the sample emits excitation and wavelength-shifted emission light which is directed back along the microscope beam path,

detection means for detecting the wavelength-shifted emission light emitted by the sample, and

a plurality of light diffracting means located on a common optical axis for individually feeding the excitation light of the plurality of light sources into the common optical axis by diffraction of the excitation light, for independently and simultaneously regulating an excitation intensity of each of the light sources, and for separating excitation light and wavelength-shifted emission light emitted by the sample by diffracting the excitation light and transmitting undiffracted the wavelength-shifted emission light, and wherein:

at least one of the light diffracting means is associated with each light source and the different wavelengths by diffraction in the light diffracting means are simultaneously or individually fed into the common optical axis and are combined in the common optical axis, ~~and~~

the detection means is so positioned with respect to the light diffracting means that only light transmitted undiffracted through the light diffracting elements is detected by the detection means, wherein the light diffracting means are chosen from the group consisting of an AOTF and an AOM, and wherein, in the direction of the microscope optics beam path, firstly an AOM and then at least one AOTF are arranged.

59. (*previously presented*) The device of claim 58, wherein the microscope is a confocal fluorescence laser microscope.

60. (*previously presented*) The device of claim 58, wherein the plurality of light diffracting means comprise acousto-optical elements.

61. (*canceled*)

62. (*canceled*)

63. (*previously presented*) The microscope of claim ~~12~~ 22, wherein the microscope is a confocal microscope.

64. (*previously presented*) The microscope of claim 22, wherein the microscope is a confocal microscope.

65. (*previously presented*) The microscope of claim 24, wherein the microscope is a confocal microscope.

66. (*previously presented*) The microscope of claim 22, wherein the light diffracting means are chosen from the group consisting of an AOTF and an AOM.

67. (*previously presented*) The fluorescence microscope of claim 37, wherein the acousto-optical means are chosen from the group consisting of an AOTF and an AOM.

68. (*previously presented*) The fluorescence microscope of claim 43, wherein the acousto-optical means are chosen from the group consisting of an AOTF and an AOM.